

# Contents

Acknowledgments, ix  
Preface, xi  
Introduction, xiii

## BASIC Programming Packages

### Chapter 1 Summation Notation, 3

---

Summation of  $N$  Variates, 3  
Summation of  $N$  Variates Using Subscripted Variables, 5  
Summation of the Squared Values of  $N$  Data Points, 9  
Exercises, 12

## Chapter 2 Analysis of Data, 13

---

Calculation of the Arithmetic Mean for a Sequence of  $N$  Numbers, 13  
Calculation of a Median for a Series of  $N$  Data Points, 16  
Calculation of the Mean Deviation for Ungrouped Data, 20  
Calculation of the Variance of a Set of  $N$  Numbers, 24  
Calculation of the Standard Deviation of  $N$  Numbers, 29  
Exercises, 34

Calculation of the Arithmetic Mean for Grouped Data, 34  
Calculation of the Mean Deviation for Grouped Data, 38  
Calculation of the Variance for Grouped Data, 43  
Calculation of the Standard Deviation of Grouped Data, 49  
Exercises, 55

Calculation of a Weighted Mean, 56  
Calculation of a Harmonic Mean, 58  
Calculation of a Geometric Mean, 60  
Exercises, 64

## Chapter 3 Probability, 65

---

Calculation of  $N$  Factorial, 65  
Calculation of a Permutation, 68  
Calculation of a Combination, 71  
Expectation, 74  
Exercises, 78

## Chapter 4 Probability Distributions, 79

---

Binomial Distribution, 79  
Cumulative Binomial, 82  
Multinomial Distribution, 86  
Poisson Distribution, 90  
Geometric Distribution, 93  
Exercises, 97

## Chapter 5 Estimation Theory, 98

---

- Estimating the Confidence Interval for a Mean of a Large Sample, 98
- Estimating the Confidence Interval for a Mean of a Small Sample, 100
- Estimating the Confidence Interval for the Difference Between Two Means ( $n_1, n_2 \geq 30$ ), 103
- Estimating the Confidence Interval for the Difference Between Two Means ( $n_1, n_2 < 30$ ), 106
- Estimating the Confidence Interval for a Proportion  $p$ , 111
- Estimating the Confidence Interval for the Difference Between Two Proportions, 113
- Estimating the Confidence Interval for  $\sigma^2$ , 115
- Exercises, 119

## Chapter 6 Hypothesis Testing, 120

---

- Tests Concerning Means ( $\sigma$  known and  $N \geq 30$ ), 120
- Tests Concerning Means ( $\sigma$  unknown and  $N < 30$ ), 122
- Testing the Difference Between Two Means ( $N_1, N_2 \geq 30$ ), 126
- Testing the Difference Between Two Means ( $N_1, N_2 < 30$ ), 128
- Testing for Independence (Case 1), 133
- Testing for Independence (Case 2), 138
- Exercises, 141

## Chapter 7 Regression and Correlation, 143

---

- Linear Regression Model, 143
- Exponential Regression Model, 148
- Pearson's Product Moment Correlation Coefficient, 152
- Spearman's Rank Correlation Coefficient, 155
- Testing the Significance of Pearson's Product Moment Correlation Coefficient, 157
- Exercises, 162

## Chapter 8 Analysis of Variance, 163

---

- Analysis of Variance: One-way Classification, 163
- Analysis of Variance: Two-way Classification, 168
- Analysis of Variance: Two-way Classification with Replication, 173
- Exercises, 182

## Chapter 9 Nonparametric Tests, 184

---

- The Runs Test, 184
- Mann-Whitney U Test, 189
- Kruskal-Wallis Test, 195
- Friedman Test, 201
- Exercises, 207